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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,923	01/17/2001	Yun-Kuei Yang	JCLA6211	5550

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EXAMINER
VINH, LAN

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 08/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/761,923	Applicant(s) YANG ET AL.
	Examiner Lan Vinh	Art Unit 1765

-- The MAILING DATE of this communication app ars on th cover sh t with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *11 July 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☒ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Liu et al (US 6,326,300) in view of Chhagan et al (US 6,303,447)

Liu discloses a method of forming dual damascene patterned conduction layer. This method comprises the steps of:

forming a substrate 10 (col 7, line 8)

forming a first dielectric layer 12 on the substrate 10, the dielectric layer is implanted with dopant (col 7, lines 9-10; col 13, lines 26-27)

forming a undoped dielectric layer 22 (silicon oxide) on the doped dielectric layer 12 (col 9, lines 33-34; the side view of fig. 4 shows that layer 22 is on layer 12)

forming a patterned photoresist layer/mask 24 on the dielectric layer 22 (col 9, lines 20-21; fig. 4 of Liu shows that patterned photoresist layer/mask 24 has an opening/first opening exposing a portion of the undoped dielectric layer 22

implanting the masked undoped dielectric layer 22 to form a ion implanted region/doped region in a portion of the exposed dielectric layer 22 below the opening in the mask 24/first opening (col 10, lines 48-51; fig.5 shows that the depth of the doped region in layer 22 does not exceed the depth of layer 22)

etching the masked undoped dielectric layer 22 to remove the ion implanted region/doped region to form a second opening in the undoped layer 22, the second opening exposes a portion of the dielectric layer 22 below the implanted/doped region (col 11, lines 16-20; fig. 5)

performing a second etching step on the masked undoped dielectric layer 22 to remove a portion of the dielectric layer 22 under the implanted/doped region and a portion of dielectric layer 12/doped dielectric layer to expose a portion of the substrate 10 (col 11, lines 25-30; fig. 6)

Unlike the instant claimed inventions as per claims 1 and 11, Liu does not specifically disclose performing the etching step on the masked undoped dielectric layer to remove the implanted/doped region to form a second opening in the undoped dielectric layer using chemical vapor HF etching.

However, Chhagan discloses a method for forming an extended metal gate comprises the step of removing a masked undoped dielectric layer 26 using vapor HF etch (col 4, lines 46-49)

Since both Liu and Chhagan are concerned with method of etching to remove a masked implanted/doped region in a dielectric layer of oxide, one skilled in the art would have found it obvious to modify Liu's step of etching the masked undoped dielectric layer 22 to remove the ion implanted/doped region by using a vapor etching step with HF to remove the implanted/doped region as per Chhagan especially since Chhagan teaches that the doped silicon oxide layer is removed using an etch with a high selectivity of doped silicon oxide to undoped silicon oxide, the etch is preferably a wet

vapor HF. Chhagan also discloses that the high selectivity of the doped silicon oxide prevents erosion of the undoped silicon oxide (col 4, lines 46-53)

Regarding claims 2-4, Liu discloses that the dielectric layer is TEOS (col 13, lines 11-13), doping the dielectric with boron and phosphorus (col 13, table 1)

Regarding claim 5, Liu discloses that doped dielectric layer 12 may be formed by silicon nitride (col 7, lines 13-17)

Regarding claim 6-7, Liu discloses that the undoped dielectric layer 22 includes silicon oxide and silicon nitride layer (col 9, lines 41-43)

Regarding claims 8-10, Liu discloses implanting the undoped dielectric layer 22 below the opening in the mask 24 with boron, phosphorous and arsenic (col 8, lines 54-57)

Regarding claim 12, fig. 5 of Liu shows that the thickness/depth of the implanted region/doped region is more than 70%/ at least 70% of the thickness of doped dielectric layer 12

Regarding claim 13, fig. 6 of Liu shows that the thickness/depth of the second opening is more than the thickness of the undoped dielectric layer 22 which reads on the thickness of the second opening is at least 70% of the thickness of the undoped dielectric layer

The limitation of claim 14 has been discussed above

Regarding claim 15, Liu discloses the step of removing the patterned photoresist/mask after etching (col 12, lines 34-36)

Response to Arguments

3. Applicant's arguments filed on 6/18/2003 have been fully considered but they are not persuasive.

The applicants argue that Liu does not teach forming an undoped dielectric layer on the doped dielectric layer because second undoped dielectric layer 22 of Liu is formed on the etch stop layer 14. This argument is not found persuasive because although the examiner recognizes that the second undoped dielectric layer 22 of Liu is formed on the etch stop layer 14 as shown in the front view of fig. 4, the side view of fig. 4 of Liu also clearly shows that undoped dielectric layer 22 is formed on the first dielectric layer 12. Thus the examiner asserts that Liu discloses forming a undoped dielectric layer on the doped dielectric layer.

In response to applicant's argument that there is no suggestion to combine the references to produce two different etching steps because Liu does not suggests two different etching step the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, since the secondary reference of Chhagan teaches the advantage of using HF vapor etch to remove doped dielectric layer/motivation to combine, one skilled in the art would have

found it obvious to employed Chhagan HF vapor etch in Liu's etching step to produce the claimed invention.

Conclusion

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302. The examiner can normally be reached on M-F 8:30-5:30.PM

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703 872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.

LV
July 30, 2003